Understanding the Rules of Life Summit

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Since 2017, NSF has been building towards breakthroughs in 10 Big Ideas by supporting pioneering research and pilot activities. One of these Big Ideas include enabling new discoveries in Understanding the Rules of Life. To identify and support emerging opportunities for the mathematical sciences community to contribute to this Big Idea and help build the nation's future, a team of researchers from a variety of fields spanning mathematics and biology were invited to a summit held in 2018. The goal of this summit was to define emerging research challenges and priorities in mathematical biology in response to "Understanding the Rules of Life." Participants provided specific suggestions and feedback to the prompt, "What should the strategic priority areas of mathematical biology be under the NSF's Rules of Life?" Six key topic areas were identified: Understanding the Rules of Life in Integrative Biological Systems: Transients and Noise; The Mathematical Foundations of Data-Inspired Biology: Learning Rules of Life from Data; Bridging Scales to Understand New Rules of Life; A New Fitness Landscape for Mathematical Theory: Quantifying Adaptation and Selection in Understanding Fundamental Rules of Life; Mathematics for the Anthropocene Era: Rules of Life in the Context of Human Impact on Natural Systems; and Broader Impacts: Convergence of Research and Education for the Rules of Life. Continuing this process of inquiry, the BEER summit will engage the bio-mathematics community to address research progress and support in these emerging priority areas, including advances at the interface of mathematics and life sciences that continue to need rigorous and comprehensive quantitative methods.